VIRTUAL PROJECTS*

Snapshots of innovation

Introduction

The new and evolving technological ecosystem of modern day life has opened exciting new possibilities for health sciences librarians to create and innovate. Almost nothing resonates as vibrantly as the opportunities posed by the never-ending need to integrate technology both inside and outside the library. Technology offers health sciences libraries incredible opportunities to create, organize, and disseminate knowledge to advance their core missions in transformative ways. Libraries are consistently early and aggressive in recognizing and seizing these opportunities.

With this column, Virtual Projects begins its second year of describing real-world implementations of exciting new technologies or applications in health sciences libraries that expand the range, reach, and depth of services across the user landscape. The six virtual projects featured in the column have been selected by an expert panel and serve as ''snapshots of innovation'' to illustrate how health sciences libraries are recognizing and embracing new, potentially transformative opportunities. Each report provides a brief narrative description of the project, technical background information, and a contact person for readers who would like to follow up for more information.

As educational paradigms are shifting to include online learning environments, new virtual learning platforms offer increased opportunities for libraries to create and collaborate. The University of Virginia provides a compelling piece describing next-generation bioinformatics tutorials in a library-curated, collaborative web portal that leverages library technology and metadata expertise to make content easily accessible and searchable for their biomedical research community. A new collaborative approach for real-time digital reference is described by Kaiser Permanente librarians who recently implemented a multi-library, shared online reference platform that uses analytics data for performance measurement, enabling continual improvement of reference outcomes throughout Kaiser Permanente. The critical role that librarians play in indexing, literature searching, and the development of user interfaces is highlighted in the report on the Directory & Repository of Educational Assessment Measures (DREAM), a project where library and educational faculty worked together to produce a unique, peer-reviewed online educational resource for health sciences educators across the country.

Health sciences libraries are also working hard to make library resources and services ''discoverable'' in user workflows. The ''decentering'' of library resources and services is the focus of the Cleveland Clinic report, which describes the deployment of content-specific access to online knowledge resources and services within the electronic health record (EHR) system to anticipate clinicians' and patients' questions and provide automatic links to relevant, library-curated resources and services. Visiting the discovery side of library services, the report from the University of Calgary on an intriguing interactive information visualization project provides a playful, open-ended, and pleasurable exploration of a valuable and historic rare book collection, a digital parallel to the serendipitous, browsing experience that users encounter while strolling through the bookshelves of an actual library.

Additionally, libraries are increasingly hosting services that support creativity and production, such as video studios, digitization facilities, and publications services. In the spirit of sharing all things new and exciting, a report is provided on the recent ''makerspace'' experience at the University of Florida, deploying new three-dimensional (3D) printing tools to enable learning, knowledge creation, and innovation across departmental boundaries.

These virtual projects are excellent examples of brave librarians seizing new opportunities and exploring innovative approaches to enrich and revitalize their own libraries by integrating discovery, enhancing learning, and catalyzing innovation. Please consider sharing your own innovative virtual project in a future column to inspire and encourage others. Submissions, suggestions, and questions should be directed to Susan Lessick at slessick@uci.edu.

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Library-curated web interface for Open Helix bioinformatics tutorials

Submitted by Jeremy Bartczak, MA, MLIS, University of Virginia

In the summer of 2013, the University of Virginia (UVa) Claude Moore Health Sciences Library (CMHSL) purchased access to a set of tutorials produced by Open Helix <http://www.openhelix.com>. The set of more than 100 tutorials specialized in teaching genomics and bioinformatics tools and resources.

This collection was acquired for the CMHSL Bioconnector website in collaboration with both the UVa School of Medicine's Bioinformatics Core and the Division of Biomedical Informatics. Open Helix provided two options for accessing its content: Subscribers could navigate tutorials via keyword and category at the Open Helix website, or the entire archive could be downloaded for local presentation. CMHSL opted to download the archive and provide enhanced navigation using descriptive metadata, curated taxonomies, and an Apache Solr search index <https://lucene.apache.org/solr/>.

Each tutorial is presented as a suite featuring video content, PowerPoint slides, and a list of practice exercises. After surveying the tutorials, staff designed an element set to describe them in CMHSL's Drupal web content management system <https://www.drupal.org>, which included information such as title, summary, subject, a link to the resource that the tutorial taught, and the creator of the related resource. The Drupal taxonomy tool was used to create controlled vocabulary lists for both the subject and resource creator fields. Because of the breadth of subject matter, a list of thirty-eight subject terms were compiled from Medical Subject Headings (MeSH), the National Cancer Institute Thesaurus, and the Software Ontology using the National Center for Biomedical Ontology's (NCBO's) BioPortal ontology browser <https://bioportal.bioontology.org>. Resource creator names were searched first in the Library of Congress name authority file and controlled locally if no record existed. Titles and descriptions were copied verbatim from the Open Helix website with permission. After metadata analysis and entry, staff uploaded the actual content of the tutorials and linked it to each description.

The CMHSL web development team used the popular Drupal Views module to structure descriptions and present the searchable tutorial interface. Simply stated, the Views module can be used to create and query structured information, filter results, and provide customized displays of retrieved content. This module allowed a set of fields to be established for recording descriptive metadata, as well as displays for individual tutorials or retrieval sets while users search. As a final step, an Apache Solr search platform was added to boost Drupal search functionality, which enabled full-text searching, faceting across elements, item count display within filters, and a resource recommender mechanism.

The completed CMHSL Open Helix tutorial page <http://www.bioconnector.virginia.edu/tutorials> launched in November 2013. Technology and metadata infrastructure for the project provided a powerful search interface and straightforward user experience. Drupal's user-friendly functionality allowed a metadata librarian to partner with a web team to seamlessly implement content and design elements. By downloading the Open Helix archive, CMHSL was able to incorporate and brand these informative resources in a collaborative library web presence. Discoverability of this ''siloed'' content is a concern. Plans are underway to use Drupal plug-ins to publish resource description framework attribute (RDFa) and Schema.org micro-data formats. This will hopefully enhance discoverability via search engine optimization and metadata ingestion into the UVa online catalog.

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Implementing a single online reference platform to serve physicians and staff across Kaiser Permanente

Submitted by Marina T. Aiello, MLIS, Kaiser Permanente Vallejo/Vacaville Medical Centers; Eve Melton, MLIS, MIS, AHIP, Kaiser Permanente Regional Office, Stockton

Kaiser Permanente (KP) is one of the largest not-for-profit health care systems in the United States, serving over 9 million people. The kpLibraries system consists of 33 libraries, 28 librarians, and 5 support staff who provide library services to approximately 240,000 KP employees across the nation. In August 2012, kpLibraries decided to implement Springshare's digital reference service to meet the growing needs of KP users for evidence-based resources to support quality patient care. The kpLibraries team elected to purchase LibAnswers, LibChat, and Reference Analytics, which provide a shared reference service and knowledgebase, a live chat service, and a reference metrics module, respectively. The librarians selected this software in conjunction with an ongoing Springshare LibGuides subscription, due to the overall high quality of customer service, pricing structure of the products, and ease of use.

To implement the new online reference service, a team of librarians was assembled to perform preliminary tasks, such as populating the fields for the user request form, designing and branding the Ask a Librarian landing page, and developing categories for tracking transactions in Reference Analytics. After completing the initial setup, the team created screencasts to provide training to the librarians, offered live web conference sessions to demonstrate the modules, and developed an internal LibGuide to house instructional documentation.

Prior to LibAnswers, the librarians received user requests via multiple methods (individual and shared email boxes and contact forms on various web pages). After the ''Ask a Librarian'' service using LibAnswers was developed, users are now directed to a single point of contact <http://kplibraries.libanswers.com>. The easy-to-navigate public interface increases

the visibility of kpLibraries' reference service, making it simpler for users to ask questions; and the shared platform expedites the processing of requests for library staff by reducing the number of physical and virtual places to review for user inquiries.

Since its introduction in August 2012, the functionality and aesthetics of Ask a Librarian has been significantly revised to improve the user experience, including removing the single search box, adjusting content for enhanced navigability, and updating the kpLibraries brand. Following the successful deployment of Lib-Answers and Reference Analytics, a similar planning, training, and implementation process was used for the rollout of the kpLibraries Chat service in August 2013. The software increased opportunities for cooperation between library staff at different physical locations and permitted the librarians to share a collective pool of reference inquiries. Regardless of their size or type, libraries that are planning to purchase this software can equally benefit from the flexible nature and customizable options of Springshare's applications. Springshare uses the software-as-a-service (SaaS) delivery model, which allows the software to be hosted on the vendor site, rather than requiring an internal server, which can be especially useful for hospital libraries faced with stringent firewalls and other Internet security restrictions.

The Reference Analytics module also made it possible for kpLibraries to streamline the process of collecting reference statistics and to maintain more accurate and robust metrics of the services delivered to users. The analytics module provides the means for librarians to track and analyze all reference transactions and identify usage patterns and trends. Since the service began in August 2012, Reference Analytics has captured 9,743 reference questions via Ask a Librarian and tracked 32,465 information contacts or transactions across all kpLibraries. LibAnswers has increased the use of reference

service throughout Kaiser Permanente and greatly benefitted users.

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Designing a DREAM database: library faculty integration in medical education assessment

Submitted by Kathy J. Davies, MLS; Lindsay Blake, MLIS, AHIP; Christie Palladino, MD; James Halbert, MS; Georgia Regents University

Increasing emphasis on competency-based assessment for health sciences students poses a serious challenge for educators. Identifying and utilizing quality assessments requires dedicated effort by medical educators to overcome multiple obstacles. Many assessments lack validity data, are published inconsistently, focus on only a subset of competencies, or are not publically available. Faculty from the Georgia Regents University (GRU) and staff from the Education Innovation Institute (EII) and Greenblatt Library formed a collaborative team to build a collection of peer-reviewed educational assessments. Initially, this project focused on creating complex search algorithms and rubrics to identify and evaluate assessments relevant to the Accreditation Council for Graduate Medical Education (ACGME) core competencies [1]. After reviewing the search and resulting pool of assessments, we formed an internal database to track validity evidence, availability, and publication record. We determined that our collection of assessments filled an existing gap in information resources and envisioned transforming it into the Directory & Repository of Educational Assessment Measures (DREAM).

GRU submitted a collaborative proposal to the Association of American Medical Colleges (AAMC), proposing that DREAM become

a resource in MedEdPORTAL. AAMC immediately recognized DREAM's potential and assigned staff to provide technical and editorial support. In October of 2013, DREAM went live as a specialized collection in MedEdPORTAL Publications, a free, peer-reviewed online publication of educational resources <https://www.mededportal.org/ dream>. DREAM represents selected assessments with psychometric data, previous implementation, and permission for free access. Users can filter assessments by health profession, audience, academic focus, methodology, and professional interest. EII maintains an Access database of all current and potential assessments.

The DREAM process begins with a literature review. GRU medical librarians work with EII medical educators to identify keywords and concepts within the framework of the six ACGME core competencies. Librarians create searches in PubMed using relevant keywords, MeSH vocabulary, and assessment terminology. Searches are reviewed by educators and refined by librarians; EII educators then comb the searches for articles identifying assessments. Once eligible assessments are located, the team contacts the developers for copyright permission to include their instruments in DREAM. Upon receiving permission, we recruit an author to write a critical analysis, synthesizing the evidence associated with use of the assessment. This critical analysis is combined with the assessment and any related materials in a Critical Synthesis Package and assigned to peer review in MedEd-PORTAL. The package is catalogued using indexing adapted from MeSH, MedEdPORTAL terms, and other controlled vocabularies reviewed by librarians and EII.

DREAM has potential as a gold standard for peer exchange of assessment resources and evaluation of assessment quality. The combination of critical analysis plus assessments for downloading allows easy incorporation into existing curricula. Searching DREAM

retrieves assessments with documented applicability for health professionals, linking to ACGME competencies and cross-referencing with MedEdPORTAL resources. To date, DREAM has copyright permission for over 130 assessments. Future steps will focus on expanding DREAM to encompass other disciplines.

The success of the DREAM project depended on expanded librarian roles to include analyzing potential competency measures, adapting existing subject indexing, and developing the DREAM record fields. Greenblatt librarians employed their knowledge of indexing, literature searching, and user interfaces as partners in building a unique information resource for health sciences education.

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Reference

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Integrating information resources and services into the electronic health record (EHR)

Submitted by Cynthia Hearthfield Avallone, MALS, AHIP, Cleveland Clinic Alumni Library

The Medicare and Medicaid electronic health record (EHR) incentive programs provide financial incentives to hospitals for the ''meaningful use'' of certified EHR technology to improve the quality of patient care, increase efficiency, and decrease the cost of health care. Objectives and measures for ''meaningful use'' of EHR technology have been estab-

lished for hospitals to use to qualify for the incentive program. Several ''meaningful use'' requirements are pertinent to libraries and provide new opportunities for librarians to help their institutions integrate evidence-based and patient education information into the EHR in compliance with these requirements.

In February 2013, the Cleveland Clinic Alumni Library <http:// portals.clevelandclinic.org/library> and Glickman Urological & Kidney Institute partnered to establish a multidisciplinary committee to identify, organize, and facilitate access to and use of point-of-care and patient education resources in urology and nephrology in Cleveland Clinic's EHR system, Epic. The committee began by identifying available e-resources by topic and subject gaps that needed filling based on common diagnostic categories, procedures, and tests that were used in the hospital. The library website, which was redesigned in July 2013, incorporated Springshare's LibGuides software, so new urology and nephrology subject guides <http://my.clevelandclinic.libguides .com/urology> were developed to provide access to subject-specific electronic resources pertinent to immediate patient care, including core reference materials, guidelines, and calculators. A key feature of the new subject guides is a separate tab for patient education resources that are organized for easy access at the point of care. Because the guides are available in the EHR, a caregiver would be able to conveniently locate and use relevant information during a patient encounter.

Five different EHR tools were also developed by the committee to enable virtual access to clinical resources for both providers and patients. A ''Clinical Resources'' tab was created for the Epic toolbar during a patient encounter with links to point-of-care resources and clinical guidelines by specialty, the newly created subject guides for urology and nephrology, and the library's home page and electronic collections. A special staff-messag-

ing tool was created for patient education consults. This tool enables physicians to send email requests to library staff for consumer health information for their patients. The librarians in turn send patients consumer education materials and links through the secure patient portal, MyChart. Based on a committee recommendation, the nursing informatics department recently approved and implemented the committee's proposal to map the ''Unresolved Education'' tab in the ''Patient Education'' module of Epic to a specific patient diagnosis and then to in-house consumer health documents that are related to that specific diagnosis. Additionally, patients using MyChart can now click on a link regarding a particular health issue that they have and be automatically mapped to relevant information in MedlinePlus Connect. Currently, the committee is developing ''smart phrases'' or macros for Epic that physicians can use to automatically drop relevant consumer health information into discharge instructions or the patient portal.

Collaboration efforts to improve access to health information for Cleveland Clinic professionals and patients have been encouraging so far. Most of the committee's implementation goals have been met. Access to evidence-based health information and patient education resources in Epic during patient encounters has been enhanced and documented to be in compliance with ''meaningful use'' objectives. Departmental training for the new resources is ongoing. The EHR projects demonstrate that librarians can play a key role in developing effective approaches for connecting professionals and patients to quality resources in a way that is an integral part of the treatment and care process.

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Using Bohemian Bookshelf for serendipitous exploration of a history of medicine rare book collection

Submitted by Chelsea Ambler, MEDes; John Brosz, PhD; Susan Powelson, MLS, AHIP; University of Calgary

Bohemian Bookshelf <http://www.alicethudt.de/BohemianBookshelf/> is an interactive information visualization tool designed by researchers at the University of Calgary to support casual, serendipitous, and open exploration of digital book collections. Designed to be both web and touch device friendly, Bohemian Bookshelf provides a series of five linked mini-visualizations to explore different aspects of a collection: book color, book length, keywords, authors, and time (published and content). Selecting a book in any of these mini-visualizations highlights adjacencies to other books in the other visualizations.

The Mackie Family History of Neuroscience Collection <http://libapps.ucalgary.ca/mackiefamily/>, acquired by the University of Calgary in 2009, is an outstanding collection of nearly 2,500 items representing over 350 years in the development of neuroscience. The earliest volume was published in 1560. Other highlights include René Descartes's classic 1662 work, *De Homine*, and the rare first neurological text, *Cerebri Anatome*, published in 1662; written by Thomas Willis, the "father of neurology"; and illustrated by Christopher Wren. The items are divided between University of Calgary Special Collections and the University of Calgary Health Sciences Library's History of Medicine room, both closed stacks.

Our goal in using Bohemian Bookshelf with the Mackie Family History of Neuroscience collection is to invite user engagement with specific items, while preserving the context of the collection as a whole and promoting discovery of related content. Item details are displayed, and relationships to the rest of the collection are revealed across the five visualizations. To provide data for Bohemian Bookshelf, we have extracted MARC catalog records to Excel for manual data entry and then formatted data to JavaScript object notation (JSON), as required by Bohemian Bookshelf. Additionally, we have altered the timeline visualization to represent author lifetime, instead of subject content time, and created hyperlinks to more detailed data, such as large cover images, extended author information, and our online library catalog. These links open in touch-friendly light-boxes, accommodating interaction on devices such as touch-tables or tablets. We are currently working to supplement collection data with author images and biographical summaries.

Two existing limitations of Bohemian Bookshelf remain unchanged. Due to the space needed to visually present all elements of the collection, total collection size should be less than 250 items. Secondly, no mechanism exists to search or filter the collection, so finding a particular item can be difficult. However, as searching for a known item is the predominant strength of existing online library catalogs, duplicating this functionality would clutter the design, require text input (making touch interaction difficult), and, most importantly, directly conflict with Bohemian Bookshelf's aim to provide serendipitous and open discovery.

Bohemian Bookshelf has created an exciting and interactive interface for exploring a valuable and historic collection, which we will continue to refine and develop. We are using Google Analytics to track usage, but the project is still too new to evaluate. We have observed students using the interface on the SMART touch-table and anticipate an increase in usage and interest when we introduce the history of medicine class to it in September 2014.

Acknowledgments

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Building for innovation with library-hosted 3D-printing and scanning

Submitted by Hannah F. Norton, MSIS; Sara Russell Gonzalez, MLIS, PhD; University of Florida

As three-dimensional (3D) printing technology matures and becomes more accessible, its use will become more widespread across disciplines. The library's role as a central, discipline-neutral space for collaboration and innovation makes it ideally situated to make visualization technology available to students, researchers, and clinicians.

At the University of Florida, competitive funding is available annually from student technology fees to develop innovative technology projects, especially those that impact students and benefit multiple disciplines. Library staff at the Marston Science Library (MSL) and the Health Science Center Library (HSCL) wrote a successful proposal for these funds to purchase 3D printers and scanners for both libraries. Although our campus houses other 3D printers in individual faculty labs and an advanced Fab Lab, hosting low-cost 3D printing in the libraries minimizes barriers for our campus community members to experiment with 3D printing and scanning for their own research and education.

The purchased equipment included a MakerBot Replicator 2 printer and NextEngine 3D Scanner at each library. The printer uses polylactic acid (PLA), a biodegradable plastic, which it heats to 230° Celsius and extrudes in

thin layers (0.1–0.3 millimeters, depending on print resolution). Printed objects are created from .stl files and can be up to 28.5 centimeters by 15.3 centimeters by 15.5 centimeters in size. The scanner uses lasers to scan 360°, with a field of view up to 41 centimeters by 56 centimeters. Multiple-angle scans are achieved by placing the object on a rotating platform.

Planning and equipment purchase occurred in the fall of 2013, followed by a period of testing by library staff and several postdoctoral researchers, faculty, and students. Testers performed basic trouble-shooting, experimented with the use of rafts and supports, printed at different resolution levels, and used software for creating 3D designs. Simultaneously, library information technology (IT) staff created a portal with which to collect information about print jobs and coordinated with business ser-vices to connect print activities with a credit card payment system. Additionally, an email discussion list on 3D printing in libraries <LIBRARYMAKERSPACE-L@LISTS .UFL.EDU> was created that pro-vides a sounding-board for imple-mentation questions and a commu-nity of colleagues with whom to share ideas.

Three-dimensional printing was made available to library users in April 2014. A basic description of the service, as well as links to resources for finding and creating 3D models, is available on the libraries' LibGuide <http://guides .uflib.ufl.edu/3dprinter>. Because the libraries wish to offer a sustain-able service, patrons are charged for printing objects. The charge was calculated to cover the likely impact of future costs for additional sup-plies (PLA plastic, platform covers, and so on) and equipment mainte-nance. Patrons are charged by the weight of the model ($0.06/gram) and time taken to print ($0.02/ minute).

MSL and HSCL are still in the early stages of offering 3D printing to the UF community. Even with minimal advertising, the service has generated significant excite-ment among students and faculty. Future plans include advertising the service extensively and adding 3D-scanning services in the fall of 2014. The introduction of 3D printing and scanning has demon-strated our libraries' interest in innovation, new technology, and partnerships with patrons in their research and teaching.

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